

5 where:

6 **KF_1** is said first priority level for a product lot entering a group
7 of current pieces of manufacturing equipment

8 **WIP_c** is a number of items within all product lots in queue for
9 the group of first following pieces of manufacturing
10 equipment,

11 **TOOL#_c** is a number of pieces of equipment within a group of
12 the first following pieces of manufacturing equipment;

13 **PPH_c** is an average number of items of product capable of
14 being manufactured by said group of the first following
15 pieces of manufacturing equipment,

16 **EFF_c** is an efficiency factor for said group of the first following
17 pieces of manufacturing equipment.

1 40. The apparatus for dispatching of claim 36 wherein:

2 means for calculating said priority factor comprises means for determining
3 said second priority level by the formula:

4
$$KF_2 = \frac{WIP_cd + INPR_cd + WIP_d}{TOOL\#_d * PPH_d * EFF_d}$$

5 where:

6 **KF_2** is said second priority level for a product lot entering a
7 current group of pieces of manufacturing equipment

8 **WIP_cd** is a number of items within all product lots in queue for
9 the group of first following pieces of manufacturing
10 equipment and the group of second following pieces of
11 manufacturing equipment,

12 **INPR_cd** is a number of items within all product lots in queue
13 for the group of first following pieces of manufacturing
14 equipment which are to proceed subsequently to the group
15 of second following pieces of manufacturing equipment,

16 **WIP_d** is a number of items within all product lots in queue for
17 the group of second following pieces of manufacturing
18 equipment,

19 **TOOL#_d** is number of pieces of equipment within a group of
20 the second following pieces of manufacturing equipment;

21 **PPH_d** is an average number of items of product capable of
22 being manufactured by said group of the second following
23 pieces of manufacturing equipment,

24 **EFF_d** is an efficiency factor for said group of the second
25 following pieces of manufacturing equipment.

- 1 41. The apparatus for dispatching of claim 36 wherein means for calculating said
2 priority factor comprises means for setting said priority factor to a third priority
3 level, if the group of first following pieces of manufacturing equipment have a
4 criticality factor of a second level.

- 1 42. The apparatus for dispatching of claim 41 further comprising means for placing
2 said product lot on the queue of one of the first following pieces of manufacturing
3 equipment, if said third priority level indicates that said product lot should not be
4 immediately dispatched for processing.

- 1 43. The apparatus for dispatching of claim 36 wherein if the group of first following
2 pieces of manufacturing equipment is not of the first type, said priority factor has
3 a fourth priority level.

- 1 44. The apparatus for dispatching of claim 43 further comprising means for placing
2 said product lot on the queue of one of the first following pieces of manufacturing
3 equipment, if said fourth priority level indicates that said product lot should not be
4 immediately dispatched for processing.

- 1 45. The apparatus for dispatching of claim 36 wherein if the group of second
2 following pieces of manufacturing equipment is not of the second type, said
3 priority factor has a fifth priority level.

- 1 46. The apparatus for dispatching of claim 45 further comprising means for placing
2 said product lot on the queue of one of the first following pieces of manufacturing

3 equipment, if said fifth priority level indicates that said product lot should not be
4 immediately dispatched for processing..

1 47. The apparatus for dispatching of claim 36 wherein if the group of first following
2 pieces of manufacturing equipment is of the first type, and the group of second
3 following pieces of manufacturing equipment is of the second type, and the group
4 of second following pieces of manufacturing equipment has a criticality factor that
5 is not the first level, said priority factor has a sixth priority level.

1 48. The apparatus for dispatching of claim 47 further comprising means for placing
2 said product lot on the queue of one of the first following pieces of manufacturing
3 equipment, if said sixth priority level indicates that said product lot should not be
4 immediately dispatched for processing.

1 49. The apparatus for dispatching of claim 35 wherein said product is substrates onto
2 which integrated circuits are fabricated.

3 50. The apparatus for dispatching of claim 35 wherein said manufacturing equipment
4 is integrated circuit processing equipment for the formation of integrated circuits
5 upon substrates.

1 51. The apparatus for dispatching of claim 35 wherein the integrated circuit
2 processing equipment includes furnaces and substrate cleaning equipment.

1 52. A computer integrated manufacturing system for dispatching at least one product
2 lot for processing manufacturing equipment within processing stages of a

3 manufacturing line, said computer integrated manufacturing system executing
4 program processes that function as:

5 a lot dispatcher in communication with an order entry system to receive
6 requests for fabrication of a product lot, in communication with a
7 process information system to receive procedures defining which
8 manufacturing equipment is required for said fabrication of said
9 product lot, and in communication with a manufacturing information
10 system to receive a status of said fabrication of said product lot, a
11 criticality factor for each manufacturing equipment, and a queue level
12 for each piece manufacturing equipment that follows a current group of
13 pieces of manufacturing equipment required for said product lot ; and

14 a priority factor calculator in communication with said lot dispatcher to
15 receive a listing of said manufacturing equipment required for said
16 fabrication of product, said criticality factor, and said queue level, for
17 determining a priority factor for said product lot such that each group of
18 pieces of manufacturing equipment following said current group of
19 pieces of manufacturing equipment has a balanced loading and said
20 product lot is processed at an expeditious time for on-time delivery.

1 53. The computer integrated manufacturing system of claim 52 wherein:

2 if groups of first following pieces of manufacturing equipment have a
3 criticality factor of a first level, said priority factor has a first priority
4 level, and

5 if groups of first following pieces of manufacturing equipment are of a first
6 type and if groups of second following pieces of manufacturing
7 equipment are of a second type, said priority factor has a second
8 priority level.

1 54. The computer integrated manufacturing system of claim 53 wherein if a
2 magnitude of said first priority level achieves a threshold level, said product lot is
3 immediately dispatched for processing.

1 55. The computer integrated manufacturing system claim 53 wherein if said second
2 priority level achieves the threshold level, said product lot is immediately
3 dispatched for processing.

1 56. The computer integrated manufacturing system of claim 53 wherein:
2 said priority factor calculator determines said first priority factor level by
3 the formula:

4
$$KF_1 = \frac{WIP_c}{TOOL\#_c * PPH_c * EFF_c}$$

5 where:

6 **KF_1** is said first priority level for a product lot entering a group
7 of current pieces of manufacturing equipment

8 **WIP_c** is a number of items within all product lots in queue for
9 the group of first following pieces of manufacturing
10 equipment,

11 **TOOL#_c** is a number of pieces of equipment within a group of
12 the first following pieces of manufacturing equipment;

13 **PPH_c** is an average number of items of product capable of
14 being manufactured by said group of the first following
15 pieces of manufacturing equipment,

16 **EFF_c** is an efficiency factor for said group of the first following
17 pieces of manufacturing equipment.

1 57. The computer integrated manufacturing system of claim 53 wherein:

2 said priority factor calculator determines said second priority level by the
3 formula:

4
$$KF_2 = \frac{WIP_cd + INPR_cd + WIP_d}{TOOL\#_d * PPH_d * EFF_d}$$

5 where:

6 KF_2 is said second priority level for a product lot entering a
7 current group of pieces of manufacturing equipment

8 WIP_cd is a number of items within all product lots in queue for
9 the group of first following pieces of manufacturing
10 equipment and the group of second following pieces of
11 manufacturing equipment,

12 INPR_cd is a number of items within all product lots in queue
13 for the group of first following pieces of manufacturing
14 equipment which are to proceed subsequently to the group
15 of second following pieces of manufacturing equipment,

16 WIP_d is a number of items within all product lots in queue for
17 the group of second following pieces of manufacturing
18 equipment,

19 TOOL#_d is number of pieces of equipment within a group of
20 the second following pieces of manufacturing equipment;

21 PPH_d is an average number of items of product capable of
22 being manufactured by said group of the second following
23 pieces of manufacturing equipment,

24 EFF_d is an efficiency factor for said group of the second
25 following pieces of manufacturing equipment.

- 1 58. The computer integrated manufacturing system of claim 53 wherein if the group
- 2 of first following pieces of manufacturing equipment has a criticality factor of a
- 3 second level, said priority factor has a third priority level.
- 1 59. The computer integrated manufacturing system of claim 58 wherein if said third
- 2 priority level indicates that said product lot should not be immediately dispatched
- 3 for processing, said product lot is placed on the queue of one of the first following
- 4 pieces of manufacturing equipment.
- 1 60. The computer integrated manufacturing system of claim 53 wherein if the group
- 2 of first following pieces of manufacturing equipment is not of the first type, said
- 3 priority factor has a fourth priority level.
- 1 61. The computer integrated manufacturing system of claim 60 wherein if said fourth
- 2 priority level indicates that said product lot should not be immediately dispatched
- 3 for processing, said product lot is placed on the queue of one of the first following
- 4 pieces of manufacturing equipment.
- 1 62. The computer integrated manufacturing system of claim 53 wherein if the group
- 2 of second following pieces of manufacturing equipment is not of the second type,
- 3 said priority factor has a fifth priority level.
- 1 63. The computer integrated manufacturing system of claim 62 wherein if said fifth
- 2 priority level indicates that said product lot should not be immediately dispatched
- 3 for processing, said product lot is placed on the queue of one of the first following
- 4 pieces of manufacturing equipment.

- 1 64. The computer integrated manufacturing system of claim 53 wherein if the group
- 2 of first following pieces of manufacturing equipment is of the first type, and the
- 3 group of second following pieces of manufacturing equipment is of the second
- 4 type, and the group of second following pieces of manufacturing equipment has a
- 5 criticality factor that is not the first level, said priority factor has a sixth priority
- 6 level.
- 1 65. The computer integrated manufacturing system of claim 64 wherein if said sixth
- 2 priority level indicates that said product lot should not be immediately dispatched
- 3 for processing, said product lot is placed on the queue of one of the first following
- 4 pieces of manufacturing equipment.
- 1 66. The computer integrated manufacturing system of claim 52 wherein said product
- 2 is substrates onto which integrated circuits are fabricated.
- 1 67. The computer integrated manufacturing system of claim 52 wherein said
- 2 manufacturing equipment is integrated circuit processing equipment for the
- 3 formation of integrated circuits upon substrates.
- 1 68. The computer integrated manufacturing system of claim 52 wherein the
- 2 integrated circuit processing equipment includes furnaces and substrate cleaning
- 3 equipment.
- 1 69. A data retention medium readable by a computer system containing a program
- 2 coding for a program process for processing to manufacturing equipment within

3 processing stages of a manufacturing line, said program coding executable by
4 said computer system and said program process comprising the steps of:

5 receiving requests for fabrication of a product lot from an order entry
6 system;

7 receiving procedures defining which manufacturing equipment is required
8 for said fabrication of said product lot from a process information
9 system;

10 receiving a status of said fabrication of said product lot, a criticality factor
11 for each manufacturing equipment, and a queue level for each piece of
12 manufacturing equipment that follows a current group of pieces of
13 manufacturing equipment required for said product lot from a
14 manufacturing information system;

15 calculating a priority factor for said product lot from a listing of said
16 manufacturing equipment required for said fabrication of product, said
17 criticality factor, and said queue level,

18 balancing the loading of each group of pieces of manufacturing equipment
19 following said current group of pieces of manufacturing equipment from
20 said priority factor such that said product lot is processed at an
21 expeditious time for on-time delivery.

1 70. The data retention medium for dispatching of claim 69 wherein said program
2 process further comprises the steps of:

3 setting said priority factor to a first priority level, if groups of first following
4 pieces of manufacturing equipment have a criticality factor of a first
5 level, and

6 setting said priority factor to a second priority level, if groups of first
7 following pieces of manufacturing equipment are of a first type and if
8 groups of second following pieces of manufacturing equipment are of a
9 second type.

1 71. The data retention medium for dispatching of claim 70 wherein said program
2 process further comprises the step of dispatching said product lot for processing,
3 if a magnitude of said first priority level achieves a threshold level.

1 72. The data retention medium for dispatching of claim 70 wherein said program
2 process further comprises the step of dispatching said product lot for processing,
3 if said second priority level achieves the threshold level.

1 73. The data retention medium for dispatching of claim 70 wherein:
2 calculating said priority factor comprises the step of determining said first
3 priority factor level by the formula:

4
$$KF_1 = \frac{WIP_c}{TOOL\#_c * PPH_c * EFF_c}$$

5 where:

6 KF_1 is said first priority level for a product lot entering a group
7 of current pieces of manufacturing equipment

8 WIP_c is a number of items within all product lots in queue for
9 the group of first following pieces of manufacturing
10 equipment,

11 TOOL#_c is a number of pieces of equipment within a group of
12 the first following pieces of manufacturing equipment;

13 PPH_c is an average number of items of product capable of
14 being manufactured by said group of the first following
15 pieces of manufacturing equipment,

16 EFF_c is an efficiency factor for said group of the first following
17 pieces of manufacturing equipment.

1 74. The data retention medium for dispatching of claim 70 wherein:

2 calculating said priority factor comprises the step of determining said
3 second priority level by the formula:

4
$$KF_2 = \frac{WIP_cd + INPR_cd + WIP_d}{TOOL\#_d * PPH_d * EFF_d}$$

5 where:

6 **KF_2** is said second priority level for a product lot entering a
7 current group of pieces of manufacturing equipment

8 **WIP_cd** is a number of items within all product lots in queue for
9 the group of first following pieces of manufacturing
10 equipment and the group of second following pieces of
11 manufacturing equipment,

12 **INPR_cd** is a number of items within all product lots in queue
13 for the group of first following pieces of manufacturing
14 equipment which are to proceed subsequently to the group
15 of second following pieces of manufacturing equipment,

16 **WIP_d** is a number of items within all product lots in queue for
17 the group of second following pieces of manufacturing
18 equipment,

19 **TOOL#_d** is number of pieces of equipment within a group of
20 the second following pieces of manufacturing equipment;

21 **PPH_d** is an average number of items of product capable of
22 being manufactured by said group of the second following
23 pieces of manufacturing equipment,

24 **EFF_d** is an efficiency factor for said group of the second
25 following pieces of manufacturing equipment.

- 1 75. The data retention medium for dispatching of claim 70 wherein calculating said
- 2 priority factor comprises the step of setting said priority factor to a third priority
- 3 level, if the group of first following pieces of manufacturing equipment has a
- 4 criticality factor of a second level.
- 1 76. The data retention medium for dispatching of claim 75 wherein said program
- 2 process further comprises the step of placing said product lot on the queue of
- 3 one of the first following pieces of manufacturing equipment, if said third priority
- 4 level indicates that said product lot should not be immediately dispatched for
- 5 processing.
- 1 77. The data retention medium for dispatching of claim 70 wherein if the group of first
- 2 following pieces of manufacturing equipment is not of the first type, said priority
- 3 factor has a fourth priority level.
- 1 78. The data retention medium for dispatching of claim 77 wherein said program
- 2 process further comprises the step of placing said product lot on the queue of
- 3 one of the first following pieces of manufacturing equipment, if said fourth priority
- 4 level indicates that said product lot should not be immediately dispatched for
- 5 processing.
- 1 79. The data retention medium for dispatching of claim 70 wherein if the group of
- 2 second following pieces of manufacturing equipment is not of the second type,
- 3 said priority factor has a fifth priority level.

- 1 80. The data retention medium for dispatching of claim 79 wherein said program
2 process further comprises the step of placing said product lot on the queue of
3 one of the first following pieces of manufacturing equipment, if said fifth priority
4 level indicates that said product lot should not be immediately dispatched for
5 processing..

- 1 81. The data retention medium for dispatching of claim 70 wherein if the group of first
2 following pieces of manufacturing equipment is of the first type, and the group of
3 second following pieces of manufacturing equipment is of the second type, and
4 the group of second following pieces of manufacturing equipment has a criticality
5 factor that is not the first level, said priority factor has a sixth priority level.

- 1 82. The data retention medium for dispatching of claim 81 wherein said program
2 process further comprises step of placing said product lot on the queue of one of
3 the first following pieces of manufacturing equipment, if said sixth priority level
4 indicates that said product lot should not be immediately dispatched for
5 processing.

- 1 83. The data retention medium for dispatching of claim 69 wherein said product is
2 substrates onto which integrated circuits are fabricated.

- 1 84. The data retention medium for dispatching of claim 69 wherein said
2 manufacturing equipment is integrated circuit processing equipment for the
3 formation of integrated circuits upon substrates.

